# Electrostatic Discharged Protection Devices (ESD) Data Sheet

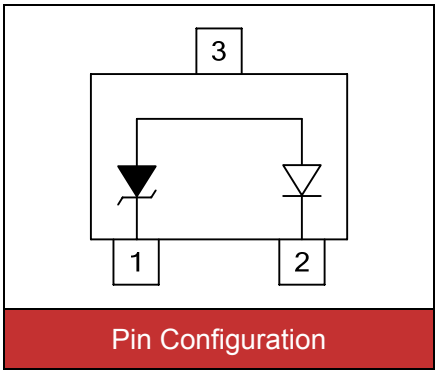
## Description

Brightking's UDT23AXXL01 series are ultra low capacitance TVS arrays designed to protect high speed data interfaces. This series has been specifically designed to protect sensitive components which are connected to high-speed data and transmission lines from overvoltage caused by electrostatic discharge (ESD), cable discharge events(CDE) and electrical fast transients(EFT).The series has a maximum capacitance of only 1.2pF. This means it can be used on circuits operating in excess of 3GHz without signal attenuation.



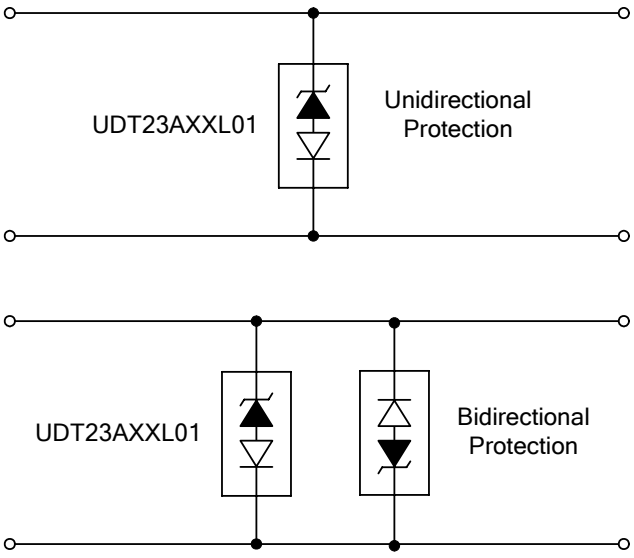
## Features

- IEC61000-4-2 ESD 15KV Air, 8KV contact compliance
- SOT-23 surface mount package
- Protects one high speed data line
- Peak power dissipation of 400W under 8/20μs waveform
- Working voltage: 3.3V, 5V, 12V, 15V and 24V
- Low leakage current
- Ultra low capacitance and clamping voltage
- Solid-state silicon avalanche technology
- Lead Free/RoHS compliant
- Solder reflow temperature: Pure Tin-Sn, 260~270℃
- Flammability rating UL 94V-0
- Meets MSL level 1, per J-STD-020




## Applications

- HDMI interface protection
- Mobile display digital interface
- RF/Antenna circuits
- USB 2.0 & Firewire ports
- GaAs photodetector protection
- HBT power Amp protection
- Infiniband transceiver protection



## Maximum Ratings

| Rating | Symbol | Value | Unit |
|---|---|---|---|
| Peak pulse power (tp=8/20μs waveform) | $P_{PP}$ | 400 | W |
| ESD voltage (Contact discharge) | $V_{ESD}$ | ±8 | kV |
| ESD voltage (Air discharge) | | ±15 | |
| Storage & operating temperature range | $T_{STG}$ ,$T_J$ | -55~+150 | ℃ |

## Electrical Characteristics ($T_J$=25℃)

UDT23A03L01 (Marking: B SJ)

| Parameter | Symbol | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Reverse stand-off voltage | $V_{RWM}$ | | | | 3.3 | V |
| Reverse breakdown voltage | $V_{BR}$ | $I_{BR}$=1mA | 4 | | | V |
| Reverse leakage current | $I_R$ | $V_R$=3.3V | | | 50 | μA |
| Clamping voltage (tp=8/20μs) | $V_C$ | $I_{PP}$=1A | | | 8 | V |
| Clamping voltage (tp=8/20μs) | $V_C$ | $I_{PP}$=5A | | | 10 | V |
| Off state junction capacitance | $C_J$ | 0Vdc,f=1MHz Between I/O pins and GND | | | 1.2 | pF |

UDT23A05L01 (Marking: B SK)

| Parameter | Symbol | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Reverse stand-off voltage | $V_{RWM}$ | | | | 5 | V |
| Reverse breakdown voltage | $V_{BR}$ | $I_{BR}$=1mA | 6 | | | V |
| Reverse leakage current | $I_R$ | $V_R$=5V | | | 5 | μA |
| Clamping voltage (tp=8/20μs) | $V_C$ | $I_{PP}$=1A | | | 9.5 | V |
| Clamping voltage (tp=8/20μs) | $V_C$ | $I_{PP}$=5A | | | 12 | V |
| Off state junction capacitance | $C_J$ | 0Vdc,f=1MHz Between I/O pins and GND | | | 1.2 | pF |

## Electrical Characteristics ($T_J$=25℃)

UDT23A12L01 (Marking: B SL)

| Parameter | Symbol | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Reverse stand-off voltage | $V_{RWM}$ | | | | 12 | V |
| Reverse breakdown voltage | $V_{BR}$ | $I_{BR}$=1mA | 13.3 | | | V |
| Reverse leakage current | $I_R$ | $V_R$=12V | | | 1 | μA |
| Clamping voltage (tp=8/20μs) | $V_C$ | $I_{PP}$=1A | | | 19 | V |
| Clamping voltage (tp=8/20μs) | $V_C$ | $I_{PP}$=5A | | | 24 | V |
| Off state junction capacitance | $C_J$ | 0Vdc,f=1MHz Between I/O pins and GND | | | 1.2 | pF |

UDT23A15L01 (Marking: B SM)

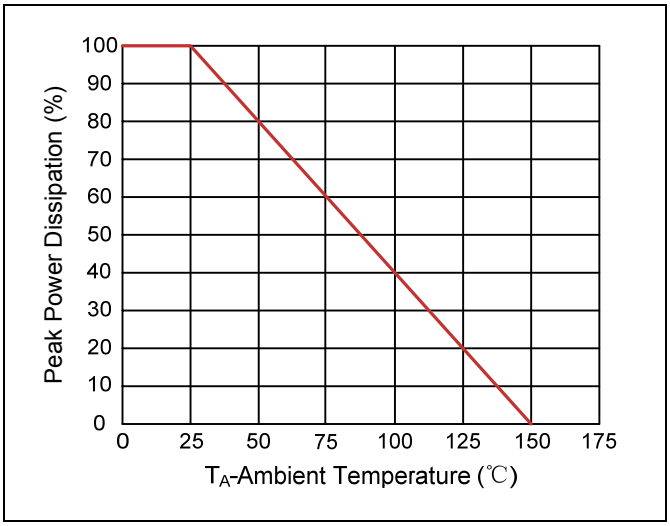
| Parameter | Symbol | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Reverse stand-off voltage | $V_{RWM}$ | | | | 15 | V |
| Reverse breakdown voltage | $V_{BR}$ | $I_{BR}$=1mA | 16.7 | | | V |
| Reverse leakage current | $I_R$ | $V_R$=15V | | | 1 | μA |
| Clamping voltage (tp=8/20μs) | $V_C$ | $I_{PP}$=1A | | | 24 | V |
| Clamping voltage (tp=8/20μs) | $V_C$ | $I_{PP}$=5A | | | 30 | V |
| Off state junction capacitance | $C_J$ | 0Vdc,f=1MHz Between I/O pins and GND | | | 1.2 | pF |

UDT23A24L01 (Marking: B SN)

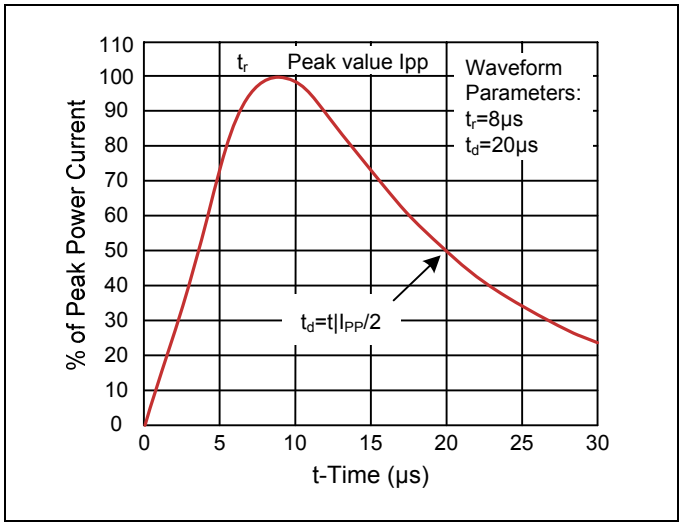
| Parameter | Symbol | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Reverse stand-off voltage | $V_{RWM}$ | | | | 24 | V |
| Reverse breakdown voltage | $V_{BR}$ | $I_{BR}$=1mA | 26.7 | | | V |
| Reverse leakage current | $I_R$ | $V_R$=24V | | | 1 | μA |
| Clamping voltage (tp=8/20μs) | $V_C$ | $I_{PP}$=1A | | | 43 | V |
| Clamping voltage (tp=8/20μs) | $V_C$ | $I_{PP}$=5A | | | 55 | V |
| Off state junction capacitance | $C_J$ | 0Vdc,f=1MHz Between I/O pins and GND | | | 1.2 | pF |

## Typical Characteristics Curves

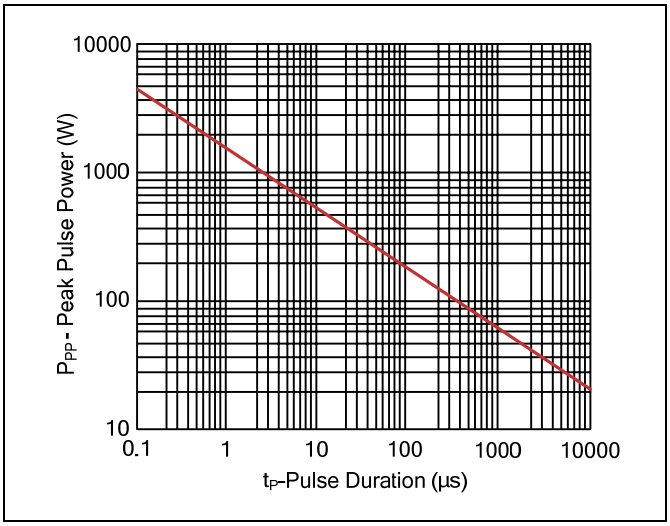
### Figure 1. Power Derating Curve



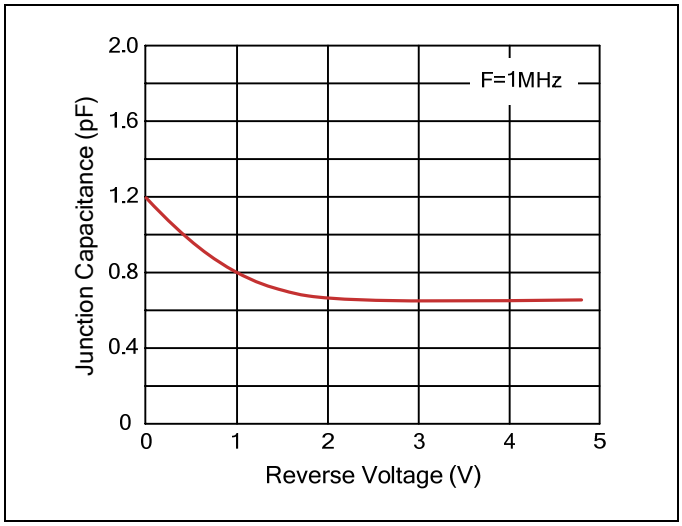

### Figure 2. Pulse Waveforms




### Figure 3. Non-Repetitive Peak Pulse vs. Pulse Time

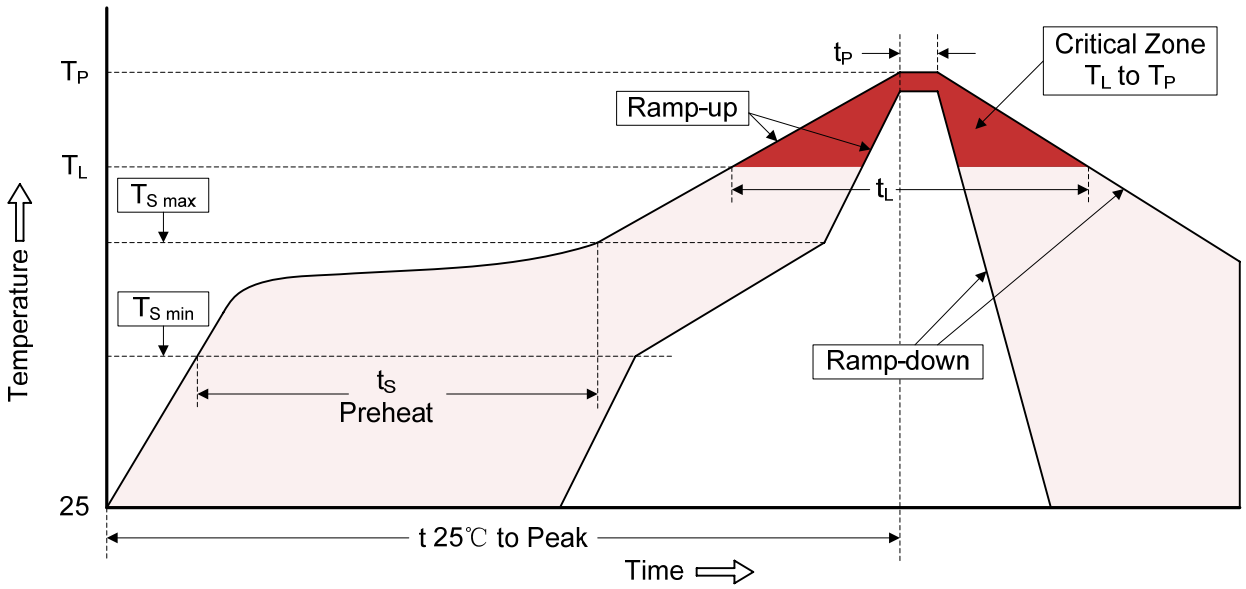



### Figure 4. Capacitance vs. Reverse Voltage



## Recommended Soldering Conditions

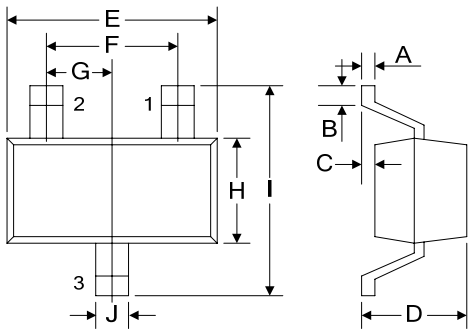
Reflow Soldering

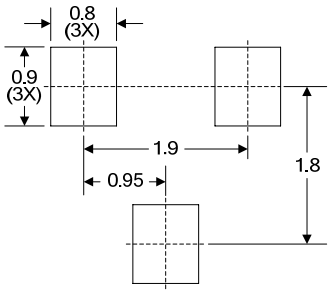



Recommended Conditions

| Profile Feature | Pb-Free Assembly |
|---|---|
| Average ramp-up rate ($T_L$ to $T_P$) | 3℃/second max. |
| Preheat<br>-Temperature Min ($T_{S\ min}$)<br>-Temperature Max ($T_{S\ max}$)<br>-Time (min to max) (ts) | <br>150℃<br>200℃<br>60-180 seconds |
| $T_{S\ max}$ to $T_L$<br>-Ramp-up Rate | <br>3℃/second max. |
| Time maintained above:<br>-Temperature ($T_L$)<br>-Time ($t_L$) | <br>217℃<br>60-150 seconds |
| Peak Temperature ($T_P$) | 260℃ |
| Time within 5℃ of actual Peak Temperature ($t_P$) | 20-40 seconds |
| Ramp-down Rate | 6℃/second max. |
| Time 25℃ to Peak Temperature | 8 minutes max. |

## Dimensions (SOT-23)



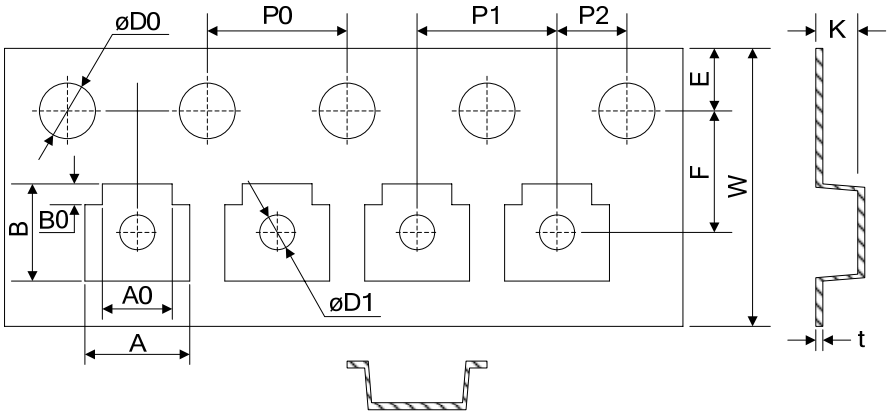




Recommended Soldering Pad Layout

| Symbol | Dimension | | | |
|---|---|---|---|---|
| | Millimeters | | Inches | |
| | Min. | Max. | Min. | Max. |
| A | 0.08 | 0.18 | 0.003 | 0.007 |
| B | 0.15 | - | 0.006 | - |
| C | - | 0.13 | - | 0.005 |
| D | 0.89 | 1.09 | 0.035 | 0.043 |
| E | 2.80 | 3.05 | 0.110 | 0.120 |
| F | 1.90 | | 0.075 | |
| G | 0.95 | | 0.037 | |
| H | 1.19 | 1.40 | 0.047 | 0.055 |
| I | 2.10 | 2.49 | 0.083 | 0.098 |
| J | 0.35 | 0.50 | 0.014 | 0.020 |

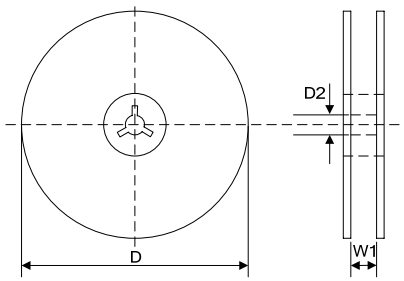
## Packaging

Tape




| Symbol | Dimension (mm) |
|---|---|
| W | 8.00±0.30 |
| P0 | 4.00±0.10 |
| P1 | 4.00±0.10 |
| P2 | 2.00±0.10 |
| D0 | Φ1.55±0.10 |
| D1 | Φ1.00±0.05 |
| E | 1.75±0.10 |
| F | 3.50±0.10 |
| A | 3.10±0.10 |
| A0 | 2.10±0.10 |
| B | 2.75±0.10 |
| B0 | 0.65±0.10 |
| K | 1.10±0.10 |
| t | 0.20±0.05 |

Reel




| | |
|---|---|
| D | Φ178.0±2.0 |
| D2 | Φ13.0 |
| W1 | 9.5 |
| Quantity: 3000PCS | |